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The characterization of the liquid scintillator detector for the PGNAA system at TRR-1/ M1 with MCNP

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The aim of this work is to optimize and characterize the liquid scintillator detector, that will use for the mixed n/⬚ radiation field at the Prompt Gamm-ray Neutron Activation Analysis System (PGNAA) at the Thai Research Reactor (TRR-1/M1). The study was carried out using the Monte Carlo N-Particle code (MCNP). The model of the liquid scintillator consists of the aluminum housing, thick 0.085 cm, and the scintillation material. The scintillation layers were varied with the difference thicknesses between 1 cm to 5 cm and the surface area of 20.09 cm2. The neutron and photon response functions for a mono-energetics energies were obtained. The results show that the detection capability depends on the scintillator thickness. In addition, the resolution function of the scintillator was reported and folded to the response function. The neutron detection efficiencies were calculated and compared to the theoretical one. The results show that the detection efficiencies were affected by the detector thickness and the energy threshold. The detector diameter (e.g. thickness, radius) will be suggested and purposed to the experimental at the PGNAA system in the future.

Keywords: liquid scintillator, MCNP, response function, detection efficiency

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